

Computer Basics

MotherBoard Components

- **Ports and Connectors**
- **Jumpers and DIP switches**

MotherBoard Components

Expansion slots

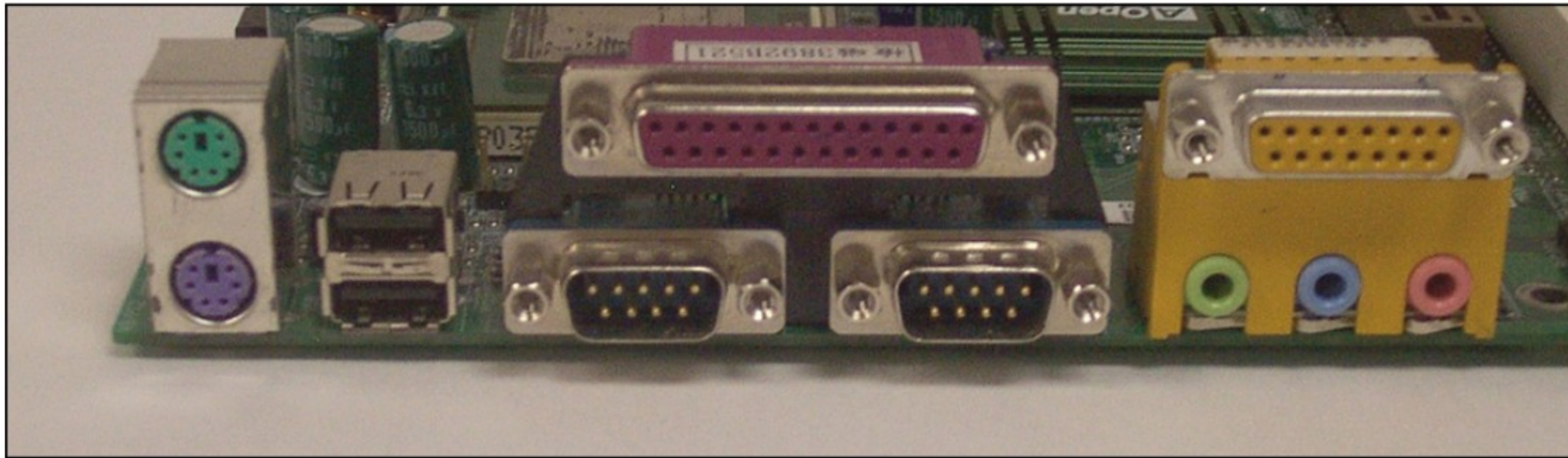
- **miniPCI and miniPCle**

- miniPCI is a 32-bit architecture that runs at 33 MHz, while miniPCle is a serial technology like PCIe.
- At 3.3 volts and a bandwidth of 32 bits, miniPCI can be found in laptops, DVD players, HDTVs, and other proprietary devices where the system size is quite small.
- There are three types of miniPCI. Types 1 and 2 have 100 connecting pins. Type 3 has 124 pins.
- You will notice that Type 2 cards are also thick enough that the card side containing the ports and connectors viewable from the outside of the chassis can support an RJ45 network port. Type 1 and Type 3 cards, however, do not--these are thinner and cannot support the width of a network port:

MotherBoard Components

Ports and connectors

A number of ports on the back of the motherboard connect the keyboard, mouse, printer, and other devices to the system.



MotherBoard Components

Ports and connectors

- **Serial ports**

- Most motherboards have serial ports integrated directly into the board.
- The serial ports are also known as communications (COM) ports.
- They are called serial ports because they send data in a series — a single bit at a time.
- If eight bits of data are being delivered to a device connected to the COM ports, the system sends the eight bits of data, one bit at a time, in single file.

MotherBoard Components

Ports and connectors

- **Serial ports**

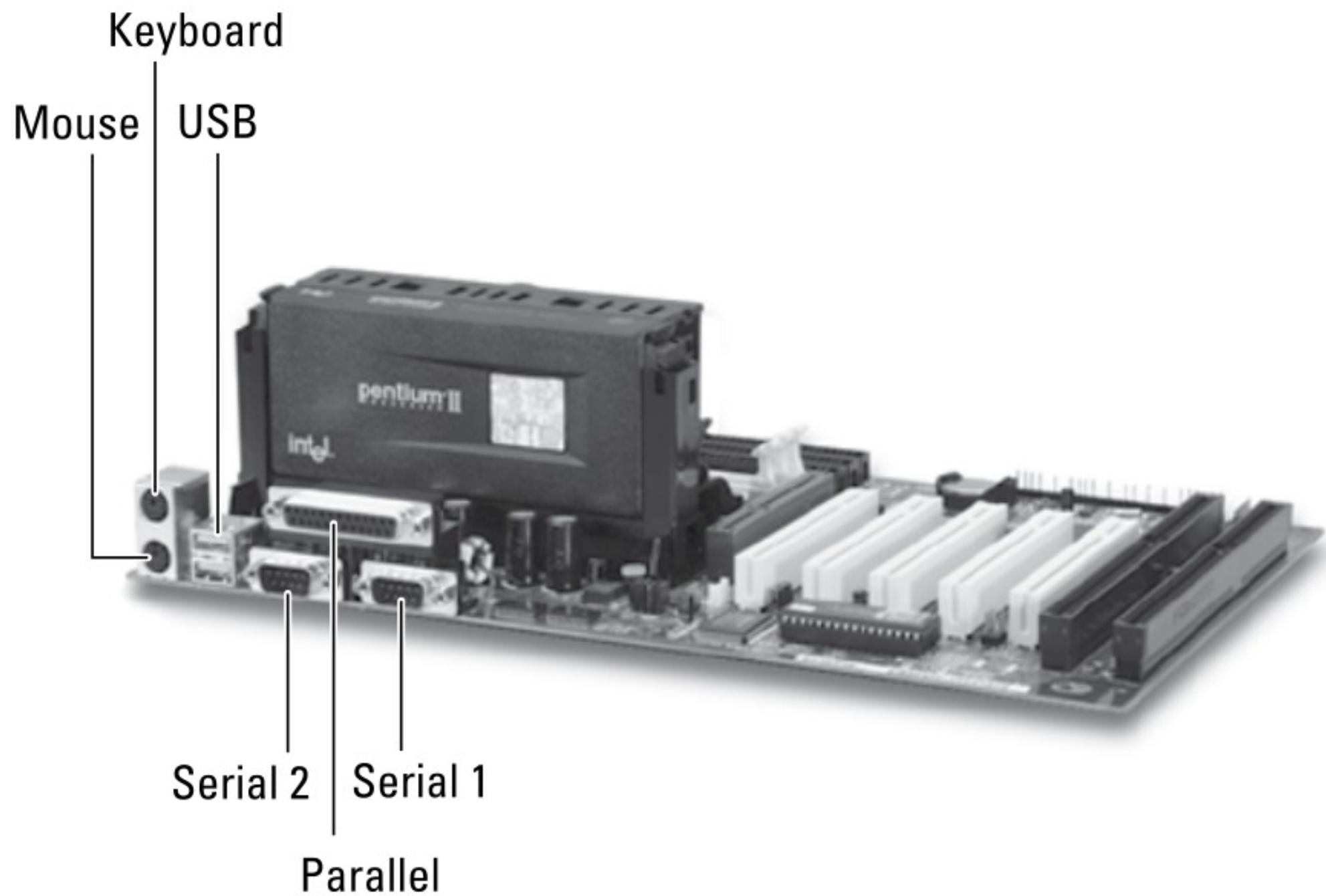
- Typically, there are two COM ports — COM1 and COM2 — on each system.
- The official standard that governs serial communication is known as RS-232, and you might see serial ports referred to as RS-232 ports.
- Serial ports on the back of the motherboard are one of two types:
 - DB9-male: A serial port with 9 pins
 - DB25-male: A serial port with 25 pins

MotherBoard Components

Ports and connectors

- **Parallel port**

- known as the printer port, or LPT1.
- The parallel port gets its name by being able to send information eight bits at a time. Whereas serial ports send only one bit at a time in single file.
- Parallel ports can send eight bits in one operation — side by side, rather than single file.
- The parallel port, known as DB25-female, has 25 pin holes and is located on the back of the motherboard.
- A serial port is a male port (the port has a number of pins in it), whereas a parallel port is a female port (contains pin holes).
- A standard printer cable has a different type of connector on each end. One end has a DB25-male connector with 25 pins, and the other end has a 36-pin Centronics connector.



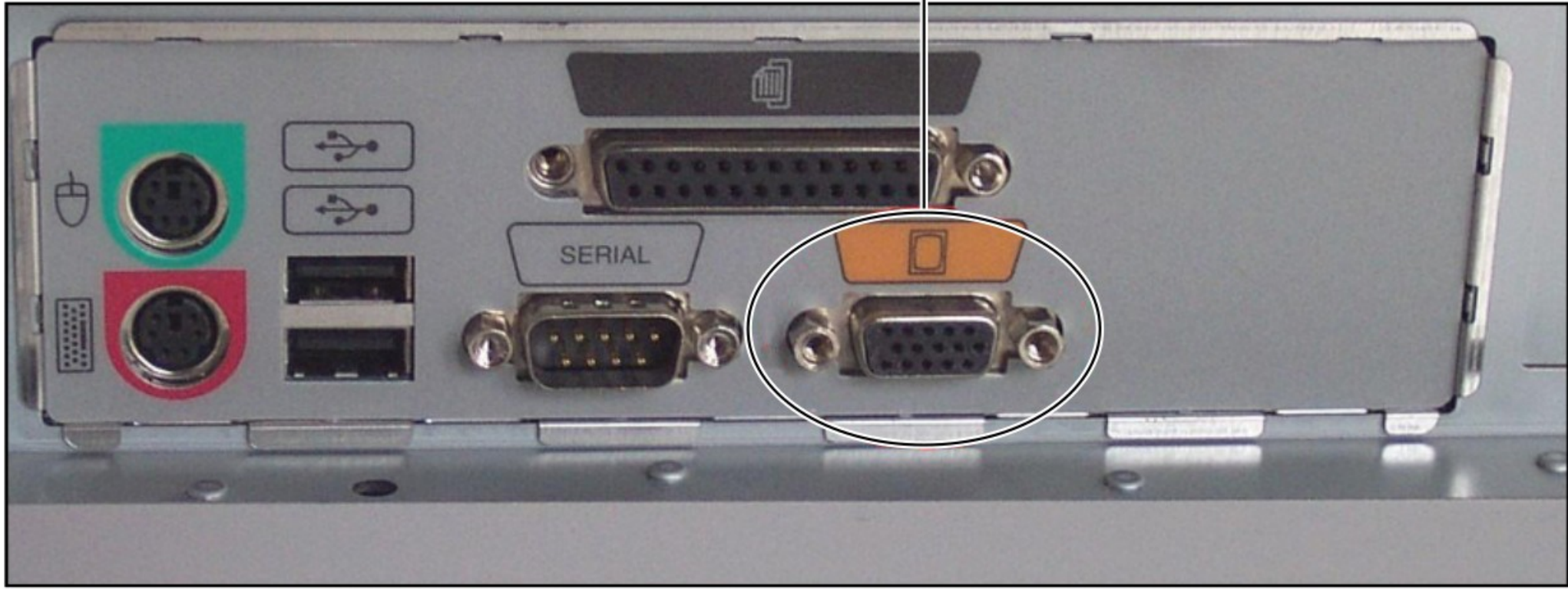
MotherBoard Components

Ports and connectors

- **Video adapter**

- In the past, a motherboard came with a built-in video adapter, sometimes called a video card or video controller.
- The video adapter converts digital data from the processor and prepares the information to be displayed onscreen.
- The VGA video port is a 15-pin female port.

Video adapter

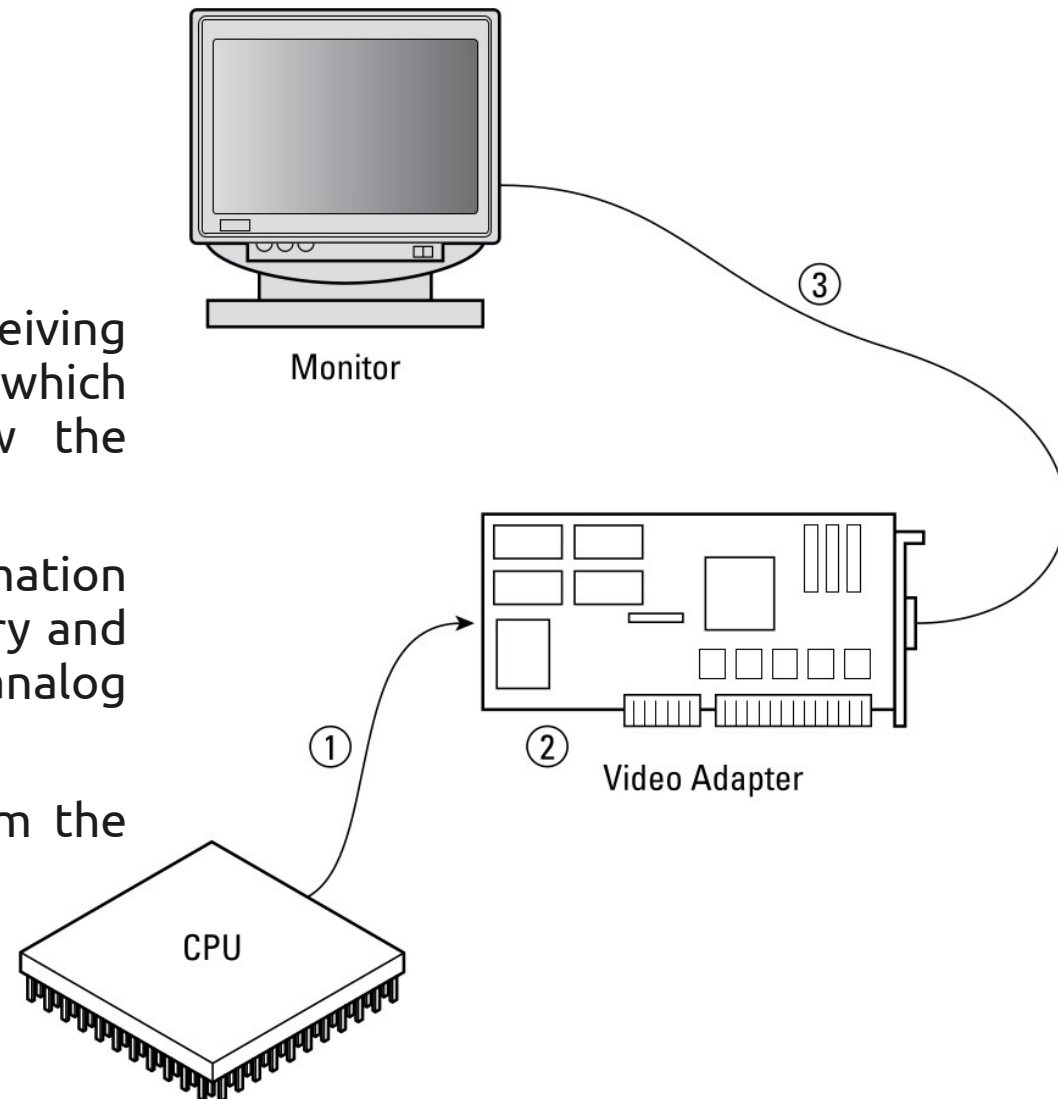


MotherBoard Components

Ports and connectors

- **Video adapter**

- 1) The video adapter is responsible for receiving digital data from the processor, which instructs the video adapter on how the images are to be drawn on the Screen.
- 2) The video adapter stores the information about drawing the images in its memory and starts converting the information into analog data that the monitor can understand.
- 3) The data is sent in analog format from the video adapter to the monitor.

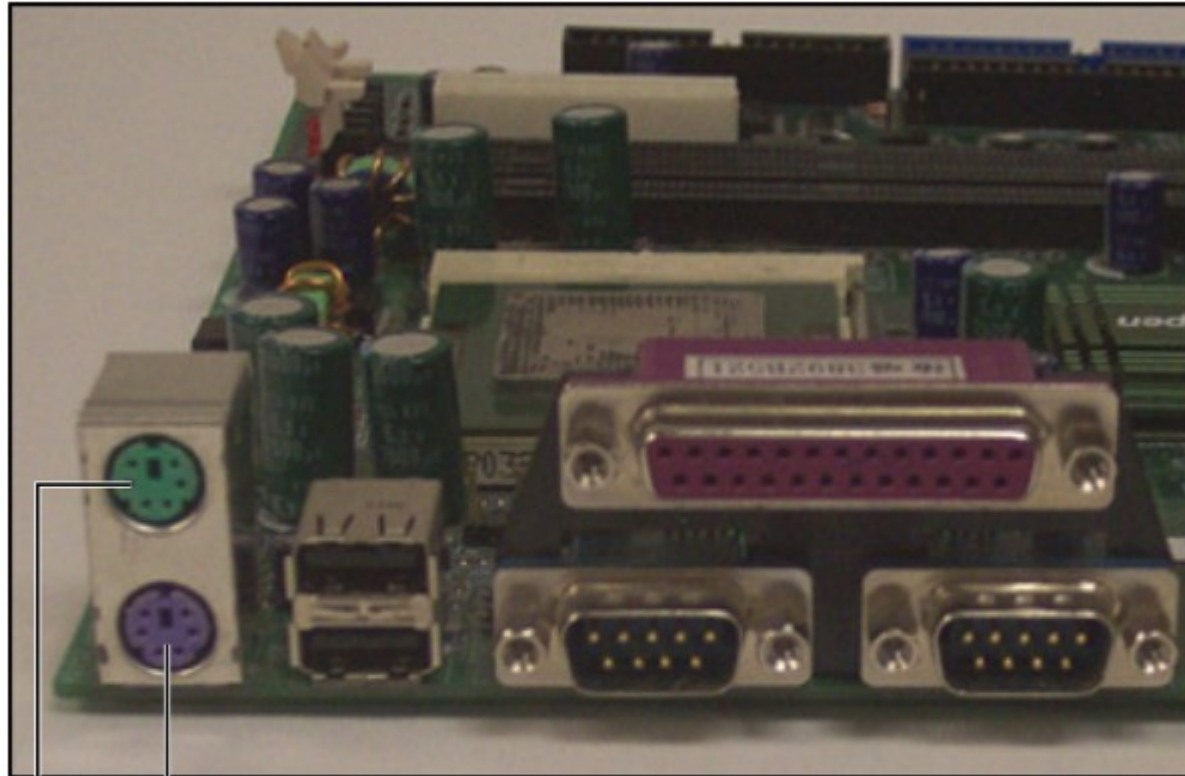


MotherBoard Components

Ports and connectors

- **Keyboard/mouse connectors**

- The mouse and keyboard connectors on motherboards today are most likely PS/2 style connectors or USB connectors.
- A PS/2 connector is a small, circular six-pin connector.
- Most systems today use USB ports to connect the keyboard and mouse to the computer.



Keyboard connector

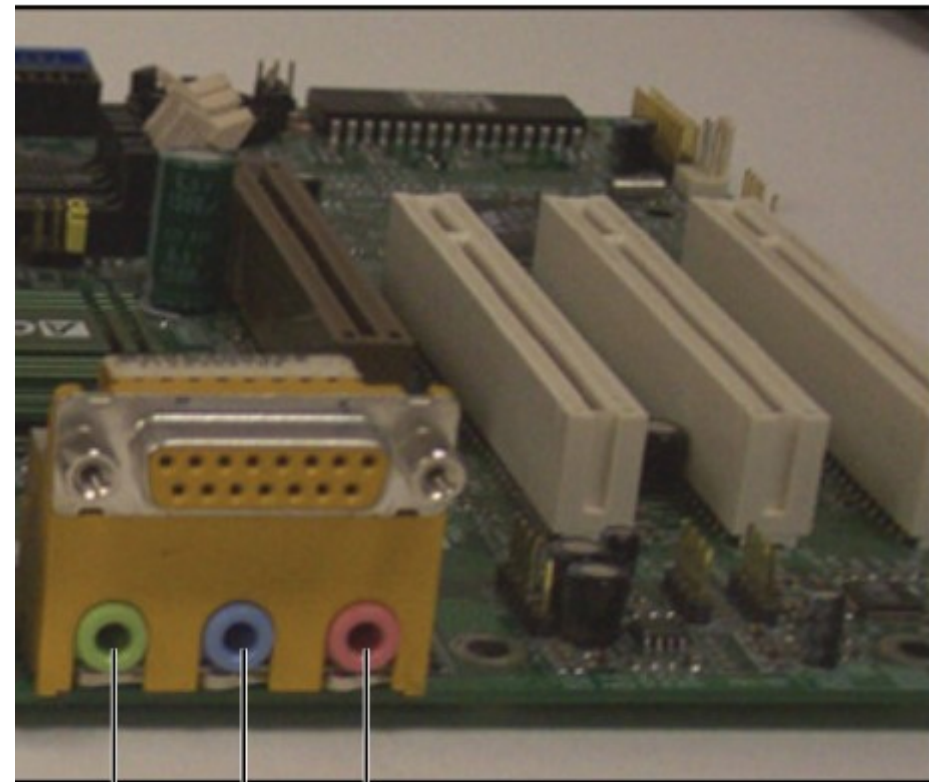
Mouse connector

MotherBoard Components

Ports and connectors

- **Sound**

- Most motherboards today have built-in sound capabilities, allowing you to connect speakers and a microphone to the computer.
- Line-in: The line-in port (typically blue) allows you to connect many audio sources to the system.
- Line-out: The speaker port (typically green) allows you to connect speakers to the computer.
- Microphone: The MIC-in port (red) allows you to connect a microphone to the system for recording.



Line-out

Line-in

MIC-in

MotherBoard Components

Ports and connectors

- **Network interface card and modem**

- A number of systems today have built-in network support via an integrated network interface card (NIC), or network card for short.
- These systems might have a built-in modem as well.
- The built-in network card has an RJ-45 port on the back of the system that looks like an oversized telephone jack
- The RJ-45 port on the back of the system board is used to connect to the network at speeds of 10 Mbps, 100 Mbps, or 1000 Mbps, which is why this is known as a 10/100/1000 port.
- It is possible to have a network port that offers a different speed, but those are the three common compatible speeds found in today's systems.

MotherBoard Components

Ports and connectors

- **USB ports**

- Universal Serial Bus (USB) is a high-speed serial technology that transfers data at 12 Mbps (USB 1.0), 480 Mbps (USB 2.0), and up to 5 Gbps for USB 3.0.
- The newest USB standard known as USB 3.1 has a transfer rate of up to 10 Gbps!
- One of the major benefits of USB is the fact that all USB devices use the same type of connector, so you won't have to guess which ports to connect the mouse, keyboard, or scanner to. If they are all USB devices, they connect to the same type of port on the computer!
- Another huge benefit of USB is that the device receives power via the USB connection. This has the benefit of when connecting a device to the computer by the USB ports, you typically will not have a power cord for that device.
- Keep in mind that some devices are large enough that they still may require their own power source, such as a USB printer.

MotherBoard Components

Ports and connectors

- **USB ports**

- USB devices also support daisy-chaining.
- For example, you can connect Device A to the back of the computer and then connect Device B to Device A, and so on.
- You can connect as many as 127 devices to a system using USB.
- A USB device that connects to the computer and then has other devices connected to it is considered a hub device.
- you can connect newer USB devices into older USB ports, but the downfall is you will only get the transfer rate of the oldest version.
- For example, if you connected a USB 3.0 device to a USB 2.0 port then you would only get the 480 Mbps.



MotherBoard Components

Ports and connectors

- **FireWire (IEEE 1394)**

- When USB 1.0 was introduced, it ran at 12 Mbps. This was a fairly good speed for most types of devices but was a little too slow when it came to multimedia devices, such as digital video cameras.
- Typically, these types of devices use a FireWire serial connection, which has a transfer rate of up to 400 Mbps and supports 63 devices in a chain.
- This initial version of FireWire is IEEE 1394a, which is also known as FireWire 400.
- The second version of FireWire is defined as the IEEE 1394b standard and transfers data at 800 Mbps! This second version of FireWire is also known as FireWire 800
- The next step in the FireWire standard was to jump to S1600, which ran at 1.57 Gbps.
- Then next standard, S3200, had a transfer rate of 3.14 Gbps.
- FireWire is a serial technology, so S stands for serial.



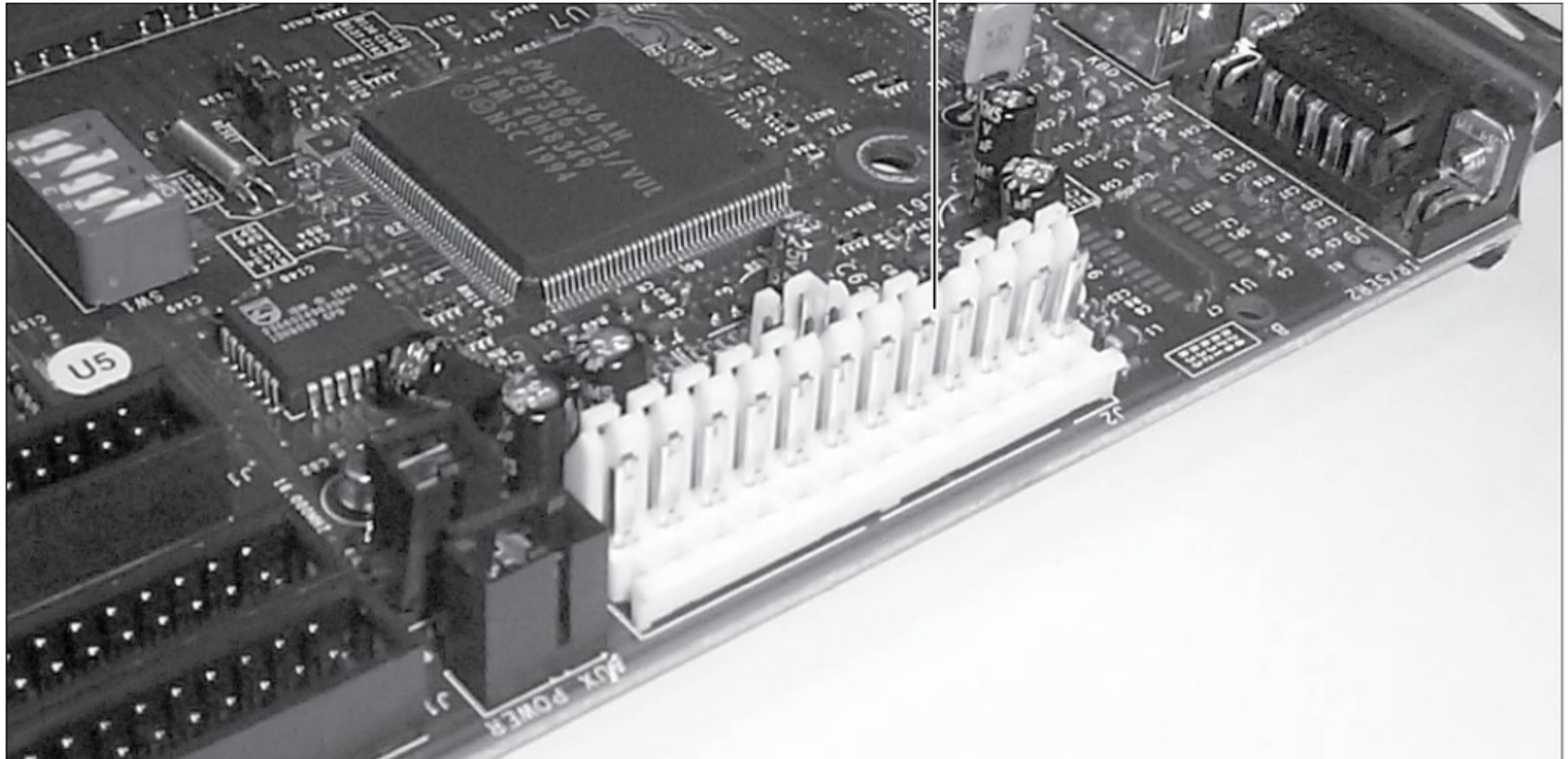
MotherBoard Components

Ports and connectors

- **Power connections and types**

- Older motherboard power connectors
 - These power connectors coming from the power supply that connect to the motherboard may be labeled as P1 and P2, or on some systems, P8 and P9
 - You have to be extremely careful to make sure that the connectors on the cable coming from the power supply to the motherboard are inserted properly, or you could damage the motherboard.
 - Often, these connectors are keyed (meaning that they can go in only one way) so that you cannot put both of the connectors in the wrong way. These older power connectors supplied power in 5 volts (V) and 12V

Motherboard power connector



MotherBoard Components

Ports and connectors

- **ATX power connectors**

- The ATX power connector supplies 3.3V, 5V, and 12V.
- is typically labeled as P1 and is a 24-pin connector.
- Most motherboards today use an extra power connector to supply power to additional components connected to the motherboard.
- A common connector is known as the P4 power connector, which supplies an additional 12V to the CPU. The P4 connector gets its name from having 4 pins





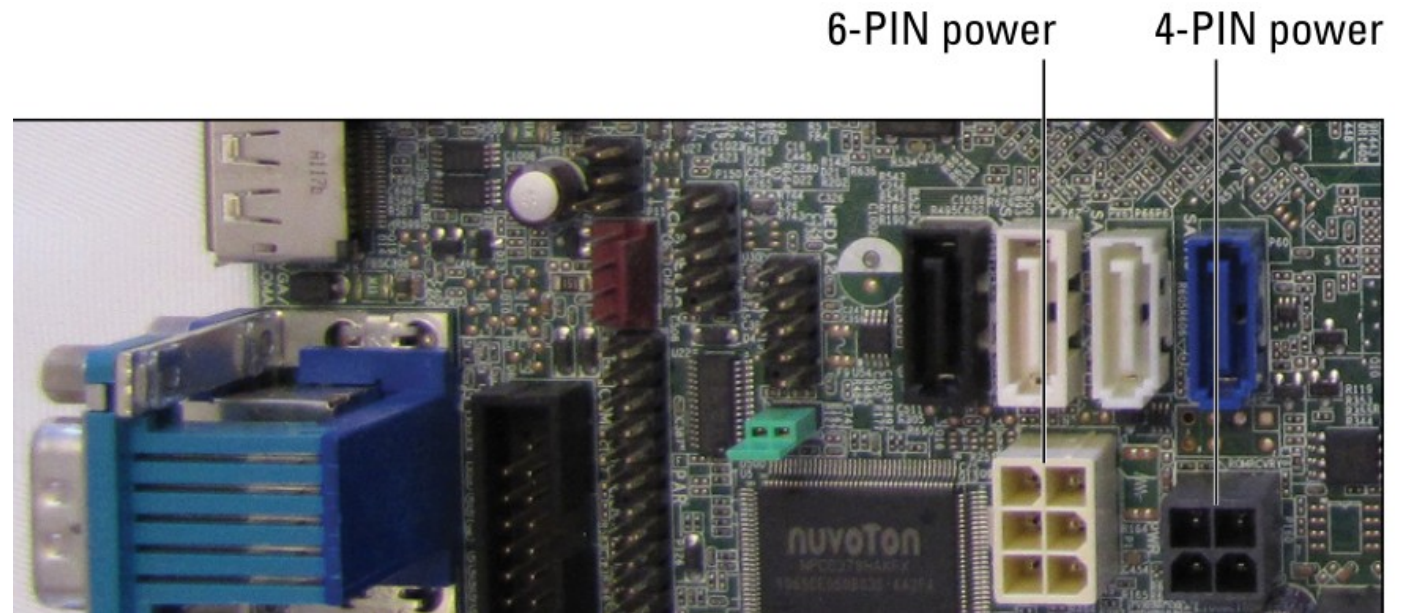
ATX 24-PIN power connector

MotherBoard Components

Ports and connectors

- **PCIe 6-PIN power connector**

- Used to supply additional power to your graphics card or GPU.
- The graphics cards today are typically PCIe cards inserted into the PCIe 16x slot on the motherboard.



MotherBoard Components

Ports and connectors

- **Fan power connectors**

- Located on the motherboard you should also see a place to connect the fans to the motherboard so that the fans can receive power from the motherboard to run.
- These power connectors are usually small connectors located around the edge of the motherboard

MotherBoard Components

Ports and connectors

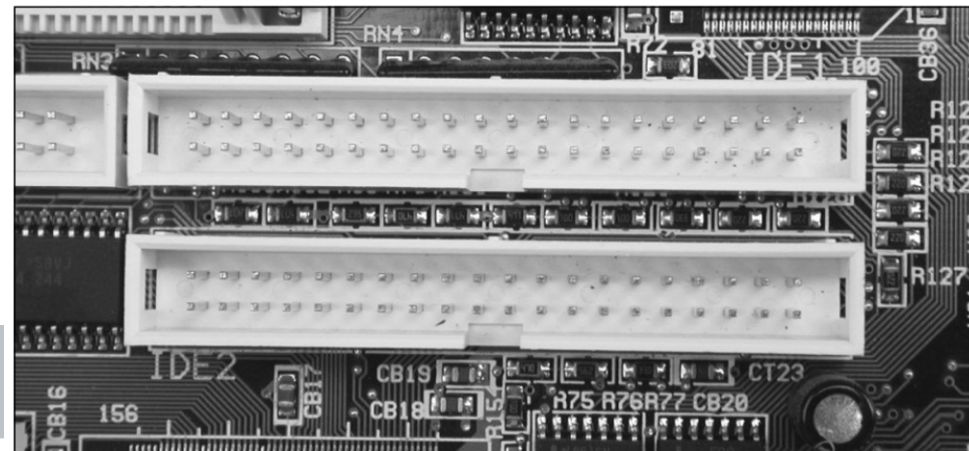
- **Drive connectors**
 - The four major types of drives in systems today are
 - EIDE (Enhanced Integrated Drive Electronics)
 - SATA (Serial Advanced Technology Attachment)
 - SCSI (Small Computer System Interface)
 - Floppy drives

MotherBoard Components

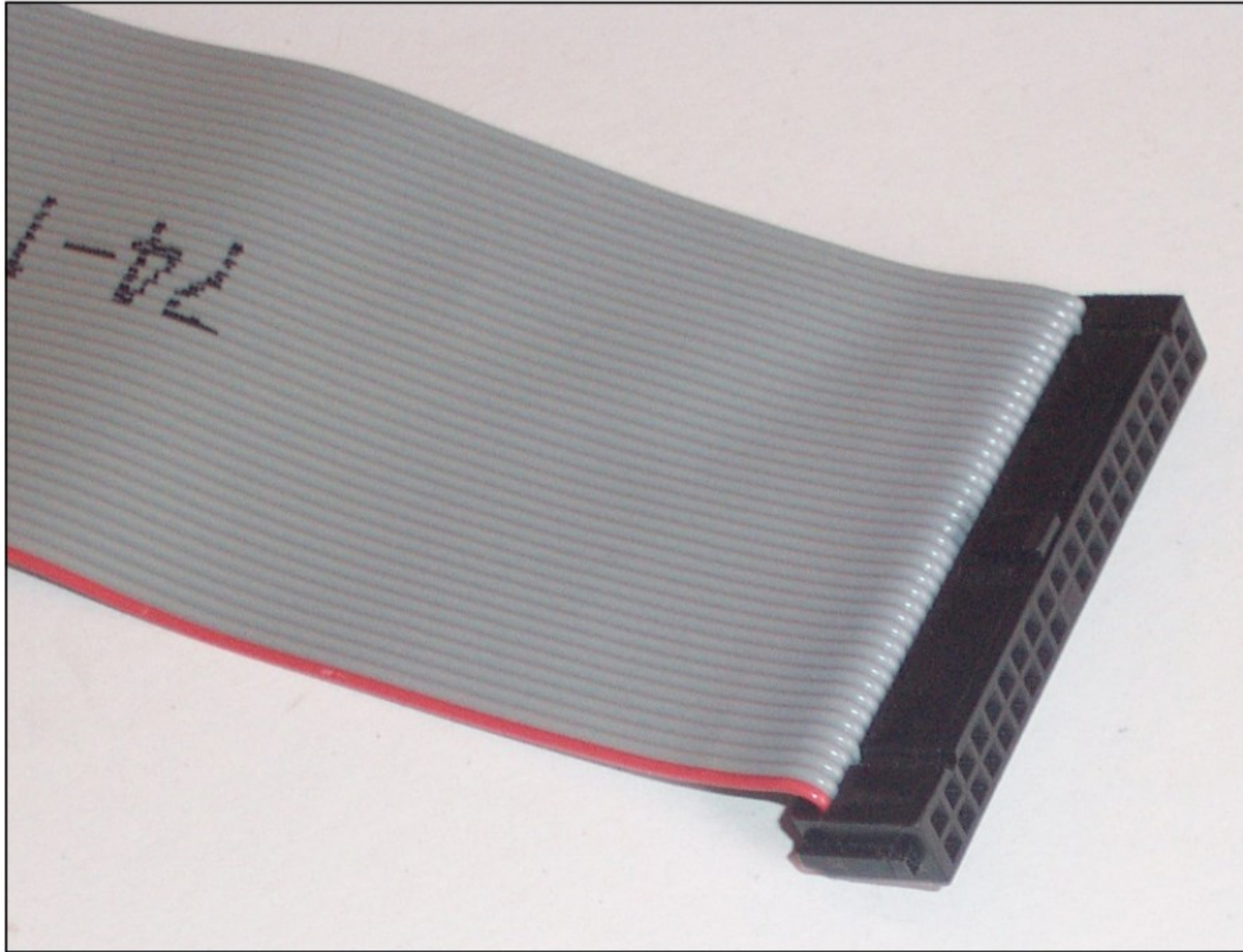
Ports and connectors

- **Drive connectors**

- IDE/EIDE connections
 - IDE drives have been around since the 1980s
 - IDE drives connect to the system the same way they always have.
 - IDE was improved to become EIDE but essentially the underlining technology is the same with a few improvements, such as IDE supported two devices in a chain while EIDE supported four devices in a chain
 - If your motherboard supports EIDE, you will have two EIDE connectors that are made up of 40 pins each



A 40-wire EIDE ribbon cable



MotherBoard Components

Ports and connectors

- **Drive connectors**

- SATA connections
 - Limitations of the EIDE architecture have kept its data transfer rate around 150 MBps.
 - The first new standard to replace EIDE — SATA — is the popular drive technology in desktop, laptops, and even some network servers. SATA has evolved over time and has some really good transfer rates:
 - SATA 1.0: Transfers data at 1.5 Gbps (150 MBps), which is the equivalent of high-end IDE technology.
 - SATA 2.0: Transfers data at 3 Gbps (300 MBps).
 - SATA 3.0: Transfers data at 6 Gbps (600 MBps).
 - SATA 3.2: Transfers data at 16 Gbps (1969 MBps).

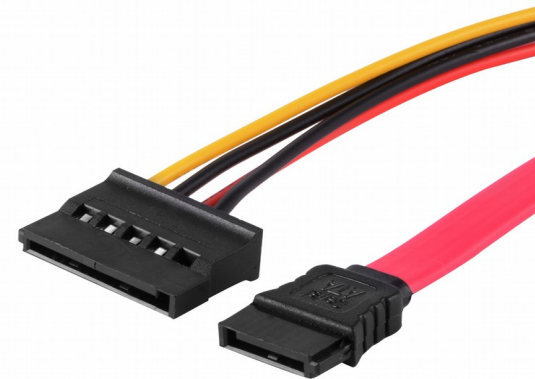
MotherBoard Components

Ports and connectors

- **Drive connectors**

- SATA connections

- Unlike EIDE drives, you cannot connect more than one SATA drive to a connector.
 - For example, if your motherboard has two SATA connectors, you can connect only two SATA drives to the system unless you purchase a SATA card that has additional connectors.
 - SATA is a hot-swappable technology that allows you to remove and add drives while the system is still running. This adds huge benefits over EIDE solutions.



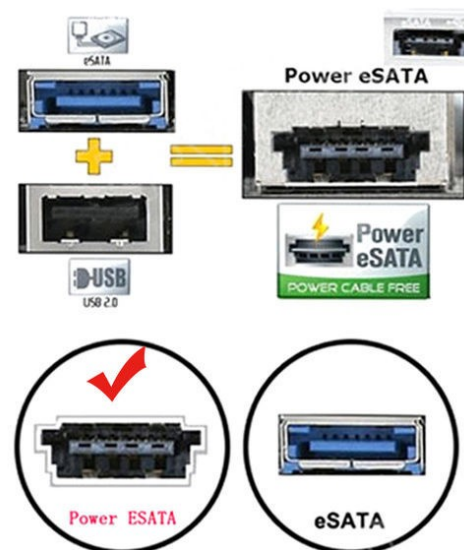
MotherBoard Components

Ports and connectors

- **Drive connectors**

- eSATA connections
 - eSATA (External SATA) allows for external drives to connect to a system via a SATA port instead of the typical USB or FireWire port
 - In the past, external drives were enclosures that held SATA drives, but the interface to connect the enclosure to the computer used USB or FireWire. This created overhead because the SATA interface is translated to USB or FireWire, which is slower than SATA
 - The eSATA device, which requires its own power source because it is an external device, can have an external SATA cable length of two meters.
 - The eSATA cable is a special cable designed to help prevent electromagnetic interference (EMI).
 - The eSATA cable has also been designed to handle more than 5,000 insertions and removals cycle of the drive; the current internal SATA cable is suited for only 50 insertions and removals.

eSATA



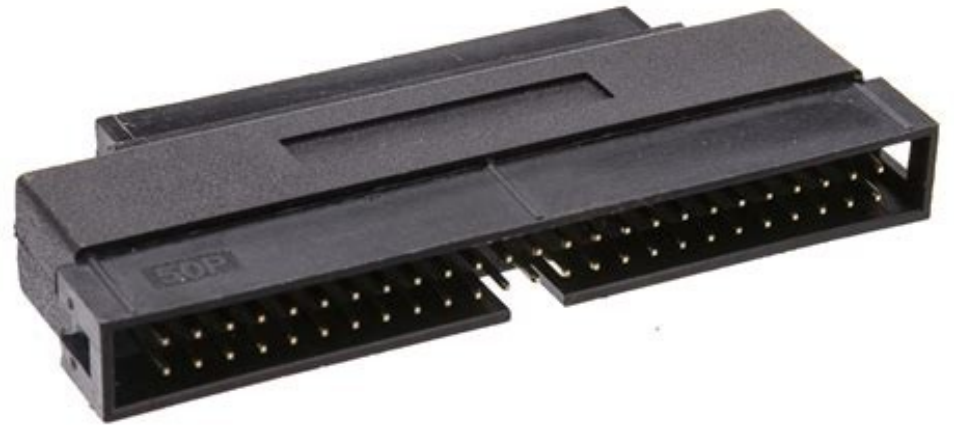
MotherBoard Components

Ports and connectors

- **Drive connectors**

- SCSI controller
 - Some high-end machines, particularly those designed for use as servers, might have a controller on the motherboard with 50 pins on it. This is the footprint of a SCSI (Small Computer System Interface) controller. Because SCSI devices outperform IDE devices, SCSI controllers are extremely popular for servers (which have greater hard disk access and storage needs than regular desktop computers).
 - To connect a SCSI drive to the 50-pin SCSI connector on the system, you use a 50-wire ribbon cable.

SCSI



MotherBoard Components

Ports and connectors

- **Drive connectors**

- SAS connectors

- Another type of hard drives that you may find in servers is Serial Attached SCSI (SAS). SAS is a serial technology that supports transfer rates of up to 12 Gbps and uses a thinner cable type than SCSI. SAS supports the installation of 128 devices in the bus as compared to SCSI, which supports 16 devices.

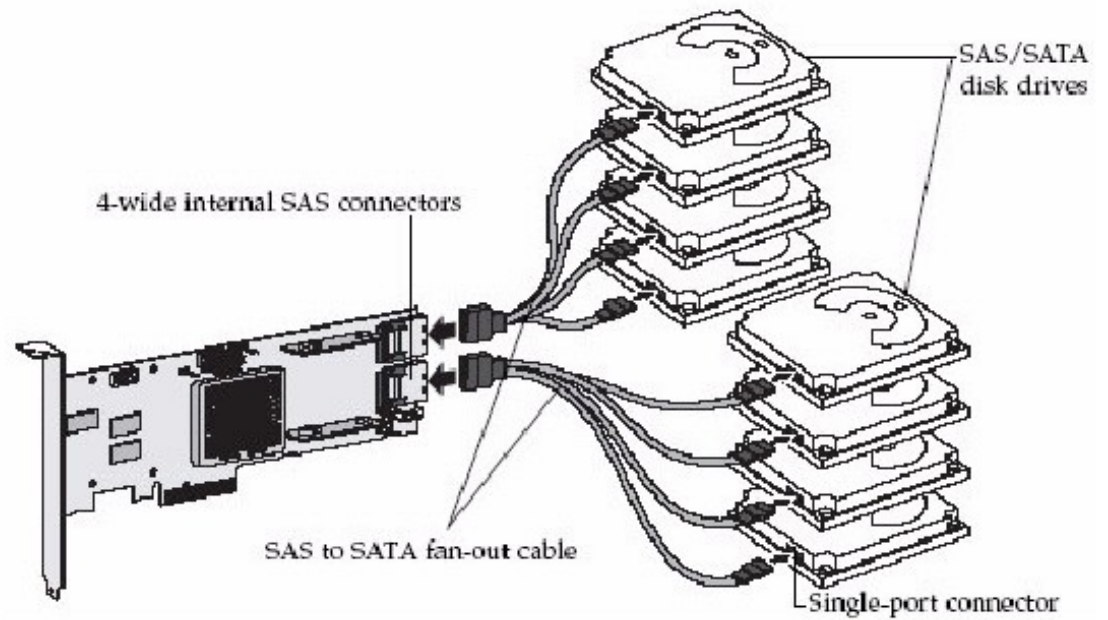
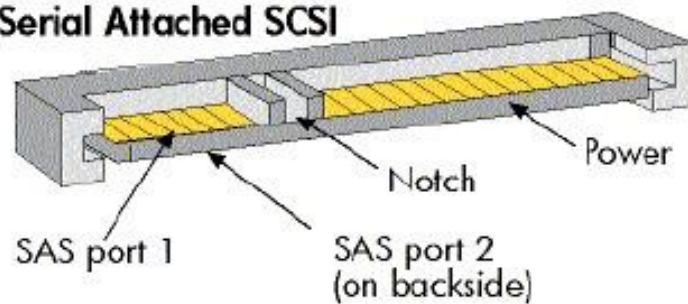
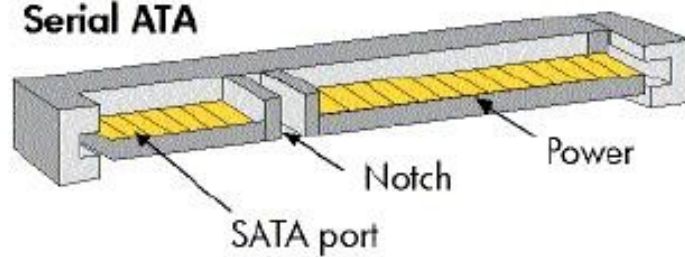


Figure 4. SAS and SATA device connectors and SAS backplane connector

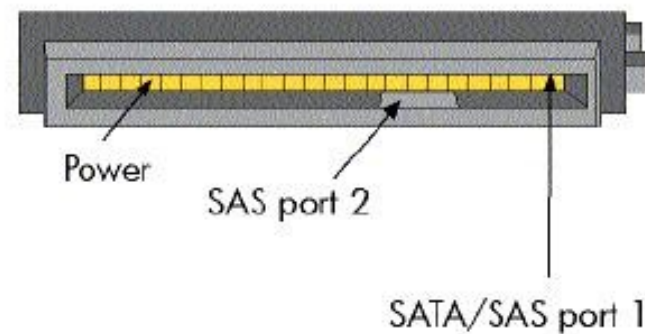
Serial Attached SCSI



Serial ATA



Serial Attached SCSI backplane connector

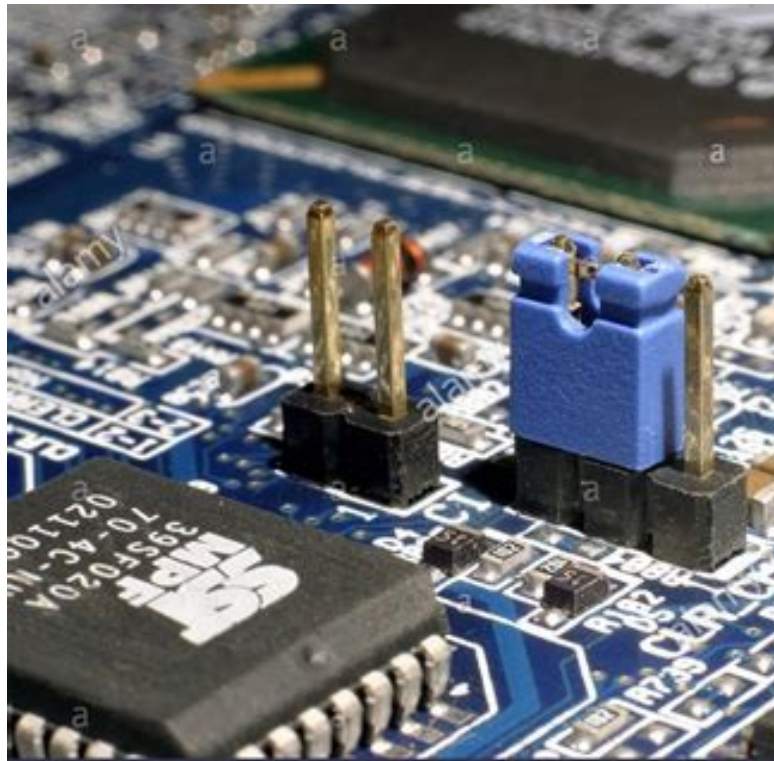



MotherBoard Components

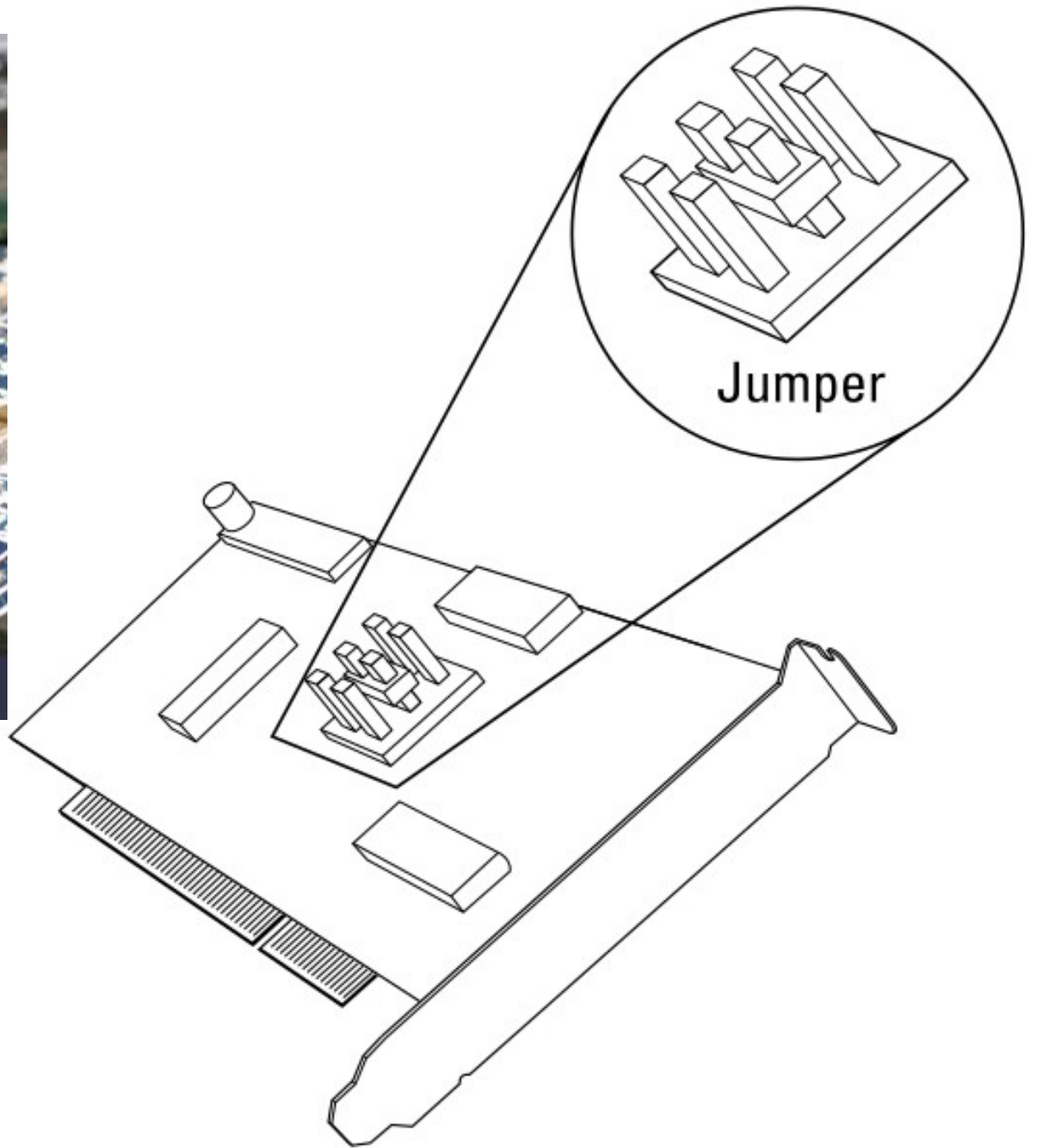
Ports and connectors

- **Jumpers and DIP switches**

- A jumper is a set of pins that have a plastic cap enclosed over them to create an electrical connection.
- The plastic cap contains a piece of metal that makes contact with the pins and creates the electrical circuit
- The circuit that is created enables a feature on the motherboard. Most motherboards (and older expansion cards) use jumpers to implement different settings.



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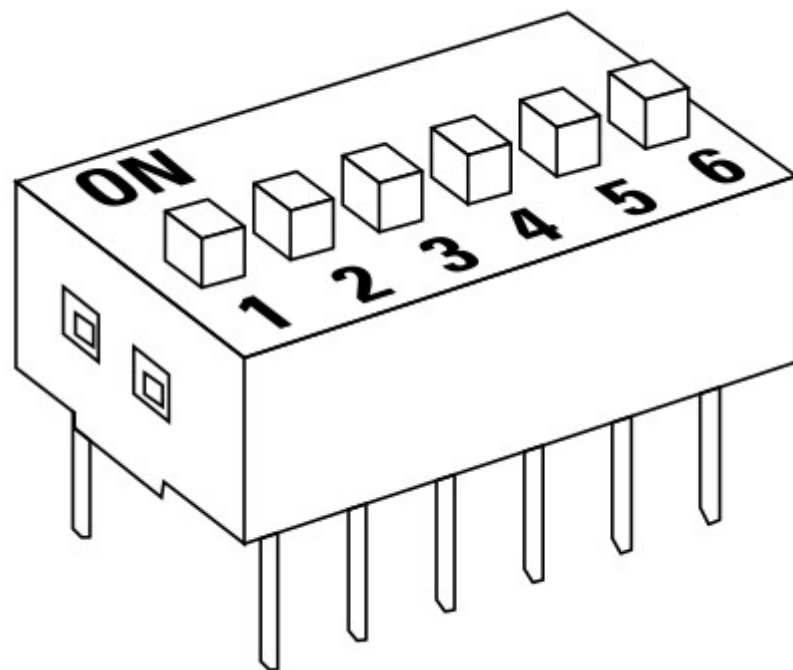
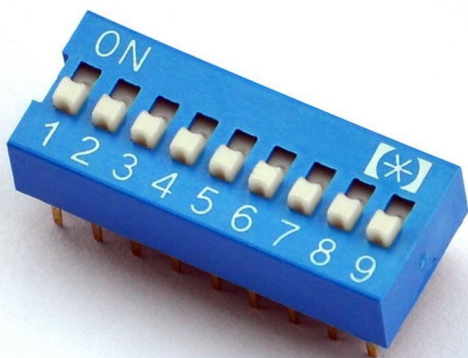
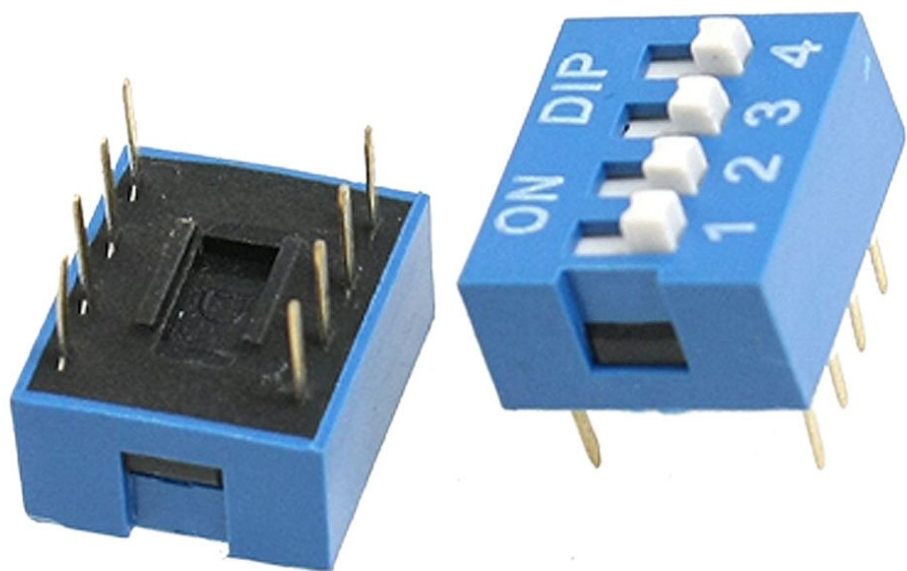


MotherBoard Components

Ports and connectors

- **Jumpers and DIP switches**

- Today, you find jumpers on motherboards, hard drives, DVD-ROM drives, and DVD drives. Many different features can be enabled or disabled on a motherboard by using jumpers.
- For example, there usually is a jumper on the motherboard used to clear the CMOS password of a system, to change the voltage supplied to the processor socket, or to change the speed of the motherboard. To know what jumper to set, check the documentation for the motherboard.
- Another popular component of a motherboard or expansion cards in the past that was used to enable or disable different features is the dual inline package (DIP) switch. A DIP switch is a set of switches that can be turned on or turned off to enable functionality on the board.
- To know what to set for on/off combinations, consult the documentation for the board.



Thanks For Attention